CLAIMS

Sub A17

1. Robot rack loading apparatus for temporary rack storage of panel assemblies, said apparatus comprising:

a rack for storage of multiple assemblies, the rack including side and bottom dunnage including slots for receiving individual assemblies in separate sets of said slots and a sensing hole adjacent one of the slots of each set;

a robot end of arm tool mountable on a robot arm and adapted for sequentially carrying individual assemblies for loading into the rack, said tool including a first sensor for sensing the sensing hole indicating the proper location of the robot arm for loading the component into the associated set of slots; and

a compliant support between the robot arm and the tool and allowing limited compliant positioning of the tool by the component to allow low stress self-adjustment of the component position during loading of the component into the slots of the selected set.

2. Apparatus as in claim 1 wherein the compliant support includes a lock for fixing the position of the compliant support for loading pickup and carrying of assemblies by the tool prior to loading of the assemblies into the rack.

3. Apparatus as in claim 1 wherein the slots in the side dunnage include lead-in angles around the upper peripheries of the slots to guide the assemblies into their proper positions upon insertion into the slots.

4. Apparatus as in claim 1 including a second sensor on said tool for sensing an object limiting forward travel of the tool to indicate a preload position of the tool.

5. A method for robot rack loading of automotive panel assemblies for temporary storage using a robot arm with an end of arm tool for carrying the assemblies and a rack including dunnage with a plurality of sets of upper and lower slots adapted to receive and hold the assemblies in spaced back to front relation, said method comprising:

providing an indicator for each set of slots, the indicators having common physical relations to the positions of their respective slots;

providing lead-in surfaces along the upper edges of the upper slots for assisting self location of the panels in their proper positions in their respective sets of slots;

providing a horizontally compliant support between the robot arm and the end of arm tool;

providing an indicator sensor on the end of arm tool for locating the indicator for the set of slots for loading the next assembly; and

carrying out the following loading steps for each assembly loaded into the rack;

supporting said assembly in a selected position on the end of arm tool;

moving the tool to a preload position;

advancing the tool until the indicator is sensed by the sensor and stopping the tool at the sensed loading location;

lowering the tool until the panel reaches the lead-in surfaces of the upper slots;

further lowering the tool to the dropoff position, the compliant support allowing the panel to be funneled by the lead-in surfaces into the set of slots with a minimum of stress;

releasing the part; and

moving the tool to a final position for the cycle.

6. A method as in claim 5 wherein the compliant device is capable of being locked in a prescribed position, the method including the steps of:

locking the compliant device prior to supporting the assembly on the end of arm tool; and

unlocking the compliant device when the panel reaches the lead-in surfaces prior to funneling the panel into the set of slots.

7. A method as in claim 5 including, prior to loading, setting in a programmable controller the rack and tool coordinate systems for the rack and panel to be loaded.

8. A method as in claim 5 including, when loading an empty rack:

moving the tool to a preload position near the back of the rack and then advancing the tool until the rear indicator is sensed.

9. A method as in claim 5 including, when loading a rack which has panel assemblies loaded therein:

moving the tool to a preload position ahead of the last loaded assembly and then;

advancing the tool until the indicator for the next open set of slots is sensed.